DOCUMENT RESUME

ED 192 905 PS 011 729

AUTHOR Stahl, Robert J.
TITLE A Creatively Creative Taxonomy on Creativity: A New Model of Creativity and Other Novel Forms of Behavior.
PUB DATE Apr 80
NOTE 26p.: Paper presented at the Annual Meeting of the American Educational Research Association (Boston, MA, April 7-9, 1980).

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Classification: *Cognitive Processes: Creative Thinking: *Creativity: *Criteria: *Evaluative Thinking: *Psychological Characteristics: *Theories

ABSTRACT

Some of the most used, misused, and abused terms in contemporary education are the words "create," "creative," and "creativity." One way of understanding creativity is to reject the current practice of assuming that creative behavior is directly caused by some special kind of mental operation called "creative thinking." What can be accepted is the fact that individuals constantly produce unique and new behaviors and products. Inherent in this position is the assumption that it is not the mental operations themselves which automatically generate creative outputs: rather, it is external criteria applied to unique, novel behaviors which ultimately determine the degree to which a person's output is "creative." Educators should use the word "novel" to describe any new response or product by an individual. The word "creative" should be used only when very specific external criteria have been met. Eleven categories of psychological variables that may influence the production of novelty are accident, accommodation, reproduction, duplication, fabrication, imitation, transfersion, substitution, experimentation, innovation, and generation. Criteria for assessing the creativity of a product or person can be described in terms of the product itself as an entity, the problem which it resolves, the field in which it is presented, and its out-of-field effects. (Author/RH)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED192905

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

A CREATIVELY CREATIVE TAXONOMY ON CREATIVITY: A NEW MODEL OF CREATIVITY AND OTHER NOVEL FORMS OF BEHAVIOR

Robert J. Stahl
Assistant Professor of Education
Department of Secondary Education
Arizona State University
Tempe, AZ 85281
(602-965-7101)

(Copyright, 1980)

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Robert J. Stahl
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Paper presented at the Annual Meeting of the American Educational Research Association, Boston, Wednesday, April 9, 1980.

PS011729

A CREATIVELY CREATIVE TAXONOMY ON CREATIVITY: A NEW MODEL OF CREATIVITY AND OTHER NOVEL FORMS OF BEHAVIOR

Dr. Robert J. Stahl
Department of Secondary Education
Arizona State University

Individuals are continually coming up with thoughts, behaviors and products which are to them new and unique. In everyday life experiences, people encounter numerous behaviors and products which are new and different to them. In many such encounters, individuals may well respond to these behaviors and/or products by referring to them as being "creative".

This tencency also exists in our schools. In their enthusiasm and commitment to facilitate the fullest potentials of their students, teachers often assign the label "creative" to nearly anything and everything a student does which is new or attractively different. Unfortunately, because the word "creative" is assigned almost at random to nearly every new and different behavior and product, one wonders whether many things exist which are not "creative".

A series of examples is introduced below to illustrate this point. As you examine the examples both individually and collectively, what one word is most likely to be assigned to describe these behaviors and products?

a) a finger painting smeared out by an elementary school pupil.

b) a modern dance performance which represents a largely impromptu reaction of the performer to a piece of music.

c) a painting by Picasso or Van Gogh.

d) a poem about love or war filled with expressive, sensual metaphors.

e) a collage hastily assembled from magazine scraps by a person to represent his/her own self.

f) a catchy one-line jingle developed by an advertising agent to promote a product.

Reports from teachers as well as the author's personal experiences lead to the identical answer--all of these behaviors and products are most likely to be labeled "creative" by the observers who witnessed them. It is also very likely that the individuals actually involved in such activities would consider their own efforts as being creative.

But do these examples represent "creative" activity or thinking? Is the label "creative" an accurate one to assign to these behaviors and products? What are the parameters which distinguish creative and non-creative activities and products from one another? Who or what should determine whether or not an activity or product is truly "creative"? These are questions this paper will attempt to answer in rather specific ways.

Ambiguities and Terminology

One of the most used, misused, and abused terms in contemporary education is the word "create"--and its alternative forms "creative", "creativity", and "creativeness" (Tiedt, 1976). Much of the confusion is due to the fact that the term has been defined differently by nearly every educator and researcher interested in creativity (Taylor, 1975a).

In addition, growing numbers of articles and books are available concerning how teachers can assist students to become more "creative" in the classroom. The primary focus of this literature describes instructional activities, resource materials and teaching methodologies believed to be effective in fostering the creative potentials of students. Although frequent mention is made of some definition of creativity or the characteristics of the creative person (e.g., citations from individuals like Guilford, Parnes, Torrance, and Gallagher abound), much of the how-to-do-it materials seemingly operate on the premise "I can't tell you exactly what creativity is, but follow my suggestions and you'll know what it is when it occurs."

This ambiguity in regard to creativity carries over into the classroom. As one overhears teachers discuss the efforts and products of their students, one continually hears the word "creative" as if to suggest that nearly everything and anything a student may do which is new, unique and appealing is creative. The instances of this vocabulary usage seem to increase in direct proportion to the degree class activities focus on individual self expression. Teachers also tend to label as "creative" new and different behaviors which are positive and attractive while labeling as "deviant" equally new and unique behaviors which are negative or disruptive. In making such distinctions, various unstated criteria are applied to distinguish between positive and negative "creative" efforts on the part of students.

In considering teacher experiences and statements such as these, a new set of questions emerge. These questions include the following: In regard to creativity, what is the relationship among prior intent, actual activity, and the

final products? Is creativity an internal or external phenomenon? Are there positive and negative dimensions to creative activity? Are there different levels or kinds of creativity?

From the Literature

Researchers, theorists, and practitioners alike have made it quite clear that the label "creativity" means different things to different people (Taylor, 1975a; Tiedt, 1976). Among the definitions and descriptions available, one finds:

a) any activity which leads to the production of something new, whether it be a new technical invention, a new discovery in science, or a new artistic performance (DeHann and Havighurst, 1957).

b) anything produced by a person which is new or unusual to him/her (Vance, 1976).

c) a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing knowledge, missing elements, or disharmonies (Torrance, 1966).

d) the forming of associative elements into new combinations which either meet specified requirements or are in some way useful (Mednick, 1962).

e) an activity which possesses four types of response properties or features:

-1- unusualness (i.e., the relative frequency of the product among all possible products);

-2- appropriateness (i.e., the relation of the product to the demands of the situation);

-3- transformation (i.e., the development of new forms that involve overcoming the constraints of reality);

-4- condensation (i.e., the degree to which the product manifests a unified and coherent relationship between simplicity and complexity) (Cronbach, 1968).

f) the power of the imagination to break away from a perceptual set so as to restructure new ideas, thoughts, and feelings into novel and meaningful bonds (Khatena and Torrance, 1973).

g) the intellectual operations relative to divergent thinking and redefinition abilities which are set in motion by a sensitivity to problems (Guilford, 1973).

h) thinking that includes some quality control of newly generated ideas including appropriateness (Crockenberg, 1972).

i) the intentionally entered into process whose final product is unknown with its originality or uniqueness providing the peak experience response (Gallagher, 1975).

j) the display of an openness to new or unusual ideas, a rich sense of humor, an ability to come up with unique solutions to problems (GTCEA, 1978).

Besides these brief definitions others have gone to great lengths to identify the relevant attributes of the phenomenon known as creativity. Guilford (1959) defined creativity by describing traits associated with the production of something creative (i.e., something the individual generates that was not produced or performed before by that same individual). Briefly stated, the six aptitudes and three non-aptitude traits he includes are:

a) Problem awareness (finding, formulating, or effectively stating a problem);

b) Fluency (generating a large number of ideas);

c) Flexibility (producing a great variety of ideas);

d) Originality (making unusual responses rather than typical or average reactions);

e) Elaboration (adding detail to make a simple premise more complex);

f) Problem solving (analyzing, synthesizing, and producing an answer);

g) Tolerance of ambiguity (avoiding rigidity in categorizing or classifying);

h) Convergent thinking (deducing one correct solution to a problem); and

i) Divergent thinking (searching for many alternative solutions).

While Guilford provides numerous examples of these traits, the problem of which traits are appropriate to what types of situations, behaviors, or products at what time remains. For example, suppose an individual proposes an old solution to a very new and different problem and onlookers are totally surprised that it indeed works to resolve the problem (Lytton, 1972). Is this creative behavior? Is the answer a creative one? Or, might this behavior be considered a type of original or novel behavior but is not in itself creative?

In addition to the definitions cited above, experts have long argued that "creative thinking" also involves a number of prerequisite steps or components all too frequently ignored by outside observers.

These steps are considered to be required phases of creative activity. It is argued that every creative activity includes phases or steps such as those identified below:

(a) the phases proposed by DeHann and Havighurst (1957):

1- period of increasing sensitivity to a problem,
2- period of searching,
3- plateau stage,
4- moment of 'creative' insight, and
5- period of confirmation.

(b) the phases proposed by Wallas (1926) and Gallagher (1964):

1- preparation,
2- incubation,
3- illumination, and
4- verification

(c) the phases proposed by Torrance (1966):

1- identifying the difficulty or problem,
2- searching for solutions,
3- making guesses or formulating hypotheses,
4- testing and retesting these hypotheses,
5- verifying and consolidating these hypotheses, and
6- communicating the findings or results

If these phases are required, then an entirely new dimension must be added to the definitions of creativity cited earlier. Creative activity must be described in far less liberal ways than merely the new production of something unique or different by the individual. Creativity would have to encompass much more time consuming, sophisticated and complex thinking than what commonly precedes most so-called "creative activity" which occurs in classrooms. The existence of these prerequisite phases would suggest that most new and unique behaviors and products are <u>not</u> creative ones--at least in the sense that these experts propose.

Other Variables to Consider

According to the literature, the relationship between intelligence and creativity is not a direct one (Getzels, 1969; Ebel, 1974). The creativity-gifted person is seen as being different from the intellectually- or academically-gifted person (GTCEA, 1978; Torrance, 1975). Torrance (1975) argues that to equate intellectual-giftedness with creativeness is to exclude nearly 3/4 of all highly creative children. And, while creativity may be a factor of intellectual giftedness, it is certainly not a prerequisite (Torrance, 1963).

In view of the above, the finding that 70 percent of the children rated high in creativity would not have been selected as being intellectually-gifted should be perplexing to many educators. If creativity is loosely defined as "doing anything which is personally different and unique", then it is difficult to believe that 70 percent of the intellectually-gifted children do little that is new or unique. Furthermore, a liberal definition of creativity would require one to

acknowledge that nearly three-fourths of the children who are highly creative are not very "smart". Both explanations seem somewhat absurd!

In much the same vein, the relationship between intelligence (i.e., I.Q.) and creativity test scores is not a clear-cut one (Crockenberg, 1972; Torrance, 1975; Ebel, 1974; Getzel, 1969). Low test scores and correlations provide no evidence that being intelligent disqualifies a person from being creative, or vice versa (Ebel, 1974). As long as I.Q. tests stress the measurement of convergent factual abilities and creativity tests are believed to reflect primarily divergent, non-factual recall responses, the controversy connected with the relationship between intelligence and creativity will continue.

The ambiguous nature of the meaning of creativity test scores is largely due to the way "creativity" has been defined by the test makers (Berelson and Steiner, 1964). If creativity requires the several prerequisite phases listed earlier, then true creative thinking probably never has occurred nor ever will actually occur during the course of a short, timed test of creativity. Subsequently, the argument that one's performance on such a test is a strong indicator of creativeness is suspect. Patrick (1937) provides some evidence that seriously questions the validity of the prerequisite phases.

If, on the other hand, these phases are not really required and any unique, different or new performance or product is truly 'creative' in nature, then it would be logical to assume that a series of wrong answers on a given convergent test could reflect strong 'creative' tendencies. Yet, few people would feel comfortable equating 'wrong'answers with creativeness. An alternative interpretation would state that creativity tests measure a different dimension of convergent behavior which is one step removed from what the average or 'non-creative' person might provide in the same situation.

This last explanation raises some intriguing possibilities. If some degree of correctness or quality is involved, then there must exist 'right' or 'proper' external criteria to assess what is supposed to be an internally produced 'divergent' response. Current creativity tests measure a person's responses according to a pre-determined scale or criterion for divergence. Hence, as it is currently viewed by many educators and researchers, high creativity test performance is the achievement of a different 'convergent response pattern' than that given by most other people.

Crockenberg (1972) warns that educators too often (and all too rapidly) mistakenly equate the mere frequency of new and different responses or products with 'high levels' or creativity. She strongly suggests that we avoid being heavily influenced by the mere multitude, elaborativeness, and/or attractiveness of so-called 'creative products' which so often have nothing to do with genuine creative thinking.

Unless these ambiguities are clarified, then, carried to the extreme, classroom teachers, curriculum developers, and teacher educators will continue to believe that anything a person does in response to a problem or situation which is different, new and attractive, is to be judged 'creative'. If this loose definition is rejected, then some degree of correctness, accuracy, and/or quality is implied but rarely stated in most conceptualizations of creativity. If

correctness or quality is involved, then there does exist a right or appropriate externally determined and measurable criteria for what is supposed to be a 'divergent' activity. Again, logic would suggest that creativity may be only an extension or the next step beyond the convergent responses expected in the situation. This phenomenon may help to explain why many very new, "creative" responses are met by rapid acceptance by individuals on the brink of the same discovery.

The fact that other people not only must recognize but also determine whether one's products are creative poses an interesting dilemma. It may well be that individuals have no problem whatsoever in generating new and unique behaviors and products. Rather, the problem arises when we find so little support and favor from others in connection with those novel things that we actually can do. As Ebel (1974) suggests, nearly all of our unique behaviors and products are ignored because few other people value them enough to mention them. Hence, built into the uniqueness must be externally demonstrable elements such as excellence, quality, appropriateness, and usefulness. The emphasis that promoters of creativity put on suspension of critical judgement, on complete openness to new ideas however bizarre, and mere numbers of novel alternatives may need to be reconsidered in light of these external criteria.

Yet another perspective relative to the understanding of creativity should be considered. Stahl (1977) has argued that many behaviors and/or products are labeled "creative" merely because they represent something which is "personally different" from the perspective/experiences of the individual observer. Hence, people are likely to use the "creative" label to describe behaviors or products which are unique to their own thinking, experiences, expectations, or perceptual orientation. This labeling occurs regardless of the degree of actual originality or the intent which went into the behavior or product itself.

A response which attracts the attention of and lies outside the personal experiences and/or capabilities of the teacher are very likely to be called "creative". A vivid example of this phenomenon is a doodled monster a second grade pupil drew for an art teacher. Upon seeing the monster the teacher immediately pointed it out as a beautiful example of a creative drawing. Later the teacher was disappointed by the news that a monster nearly identical to that doodled was observed by the child two days earlier on a Saturday morning cartoon show. Without that knowledge, the teacher to this day would still believe that that doodled monster was a result of creative thinking and behavior. Many an English composition has been labeled creative because the students used language (e.g., metaphors) in ways different from the teacher's expectations. In both cases the products are labeled "creative" merely because they <u>appeared to be</u> quite original and were outside the frames of reference the teachers had for that situation and those students at that time (i.e., they were personally different experiences for these teachers). Interestingly, students who are more clever than their teachers are very likely to be identified as being the most creative students in the class--providing of course their cleverness is routed in positive directions.

In terms of the "personally different" perspective, creativity is measured by the degree to which a person's new behavior or product falls outside the range of

convergent-divergent responses already known by or predictable to the teacher or other outside observer. Elements such as attractiveness, functionality, cleverness, and appropriateness are often included or implied as criteria. In such situations, the assumption is made that the actual creativity is directly the result of internal thought processes which presumably caused the creative response or product development (Ebel, 1974). Rather, the real criteria used were externally applied standards which focused almost exclusively on the observable and measurable behaviors/products of the individual. These external standards frequently have little or no direct connection to the actual thought (or information) processing which occurred at the time of the "creative" response.

In short, we must be careful not to disassociate "creativity" from quality and appropriateness nor associate it entirely with fluency, divergence or idea-generation. The author's concern for the external criteria of correctness, accuracy, quality, appropriateness, etc., of a final 'creative' product or behavior is not a new one (Cronbach, 1971; Crockenberg, 1972; Ebel, 1974; Taylor, 1975 a,b).

On the Possible Non-Existence of Creative Thinking

Is it possible that the supposed existence of a special intellectual process of or for creative thinking is nothing more than a figment of our own "fictions" about the mind?

One way of coming to understand creativity is to reject the current practice of assuming that creative behavior is directly caused by some special kind of mental operations called "creative thinking". To attribute differences in innovation or uniqueness to inherent differences in the creativity of people goes well beyond any available evidence we have about human thinking, memory or learning. Such a cause-effect relationship between hypothesized distinct creative thinking processes and creative output produces an illusion of explanation in the absence of any real explanation for such differences (Ebel, 1974). The simplest and easiest explanation for creativity is (and has been) given credibility by its own popularity. Nevertheless, for us to continue to operate with the assumption that real, distinct creative thinking processes really do exist misdirects our attention from achieving any real understanding. As Ebel so aptly puts it, "It is to invoke the help of dryads (mental fictions) to explain away what we do not understand." [parenthetical phrase inserted by author.]

Consistent with the traditional perspective, we have associated creativity with differences between a person's previous and new behaviors and/or between the behaviors of two or more persons with the implication that the greater the differences, the more 'creative' the thinking. Yet, the only evidence we have of a person's creativity is in the uniqueness, appropriateness, and quality of an actual behavior or product (which is/can be observed and measured). To argue that one is creative because of one's creativity is completely circular (Ebel, 1974). Furthermore, researchers have not supplied any tangible evidence which verifies the existence of distinct creative thinking processes separate from the behaviors they produce. Even the research on Alpha Waves (Martindale, 1975) stress a "state of the mind" rather than actual, distinct processes which may contribute to some forms of innovative behaviors. Thus, without the empirical evidence, continued support

for the existence of distinct creative thinking processes as causal operations is to accept a purely hypothetical construct as the cause of observable, unique and novel behaviors, event and products (Ebel, 1974).

It seems appropriate to examine some consequences of adhering to the position that creativity is caused by distinct creative thinking processes. If such processes actually do exist, then we must accept the fact that inherent creativity rather than developed ability, opportunity, effort, intentions, task or career requirements, or circumstances, accounts for the unique behaviors and products achieved by so-called creative people. Efforts to explain the creativity of individuals in such divergent areas as art, science, architecture, literature, directed at identifying a single "cause" of all these creative behaviors have not been successful (Berelson and Steiner, 1964; Taylor, 1975a,b). Interesting, there has yet to be identified a distinct activity, attribute, or process that is commonly shared by all recognized 'creative' persons which sets them all significantly (and I don't mean in the statistically hallowed sense of .05) apart from less-creative people.

That these distinctions do not exist is supported by a list of characteristics or distinguishing features and attributes of gifted and talented individuals published by the Council for Exceptional Children - CEC (1978). (See Figures 1 and 2). In reference to the "creative characteristics" of gifted/talented children, the CEC points out that these characteristics "..constitute observable behaviors that can be thought of as clues to more specific behaviors" to identify the creative person underlining by the author . Even in the list in Figure 1, there is an implied cause-effect relationship between a type of thinking (e.g., 'fluent', 'flexible') and the described behaviors which follows. Here again, even the research and literature review by the CEC did not identify clearly distinguishable characteristics of either creative behaviors or so-called creative thinking processes.

Besides these inabilities to isolate this supposed internal causal factor, we may briefly examine creativity within the context of developmental psychology.

Werner in Langer (1970) suggest individuals make the following progressions in their mental development:

1. primitive, concrete knowledge and relating
2. more complex, perceptual knowledge and relating
3. knowledge and relating involving formation and use of abstract principles

If these are indeed developmental, then individuals either use different mental operations at each of these levels to produce creative behaviors, thus making their creations qualitatively different from an internal perspective, or use the same creative thinking processes across all three levels, thus making their creations qualitatively different because of inherent limitations in their mental development. If creative thinking really does involve the use of abstractions and abstract principles, as some suggest, then developmentalists would have to argue that many children up through ages 8-12 are probably not capable of such thinking. This same claim holds true for advocates of the Piagetian persuasion.

Figure 1

Non-Test Ways of Identifying the Creatively Gifted Person*

Based upon the results on the observation of children's behavior and an analysis of what they produced, the following represent areas which may indicate exceptional creativity (Torrance, 1977):

- Ability to express feelings and emotions.
- Ability to improvise with commonplace materials and objects.
- Articulateness in role playing, sociodrama, and story telling.
- Enjoyment of and ability in visual arts, such as drawing, painting, and sculpture.
- Enjoyment of and ability in creative movement, dance, and dramatics.
- Enjoyment of and ability in instrumental and vocal music and music rhythm.
- Use of expressive speech.
- Fluency and flexibility in figural media.
- Enjoyment of and skills in group activities and problem solving.
- Responsiveness to the concrete.
- Responsiveness to the kinesthetic.
- Expressiveness of gestures and body language and the ability to interpret body language.
- Humor
- Richness of imagery in informal language.
- Originality of ideas in problem solving.
- Problem centeredness or persistence in problem solving.
- Emotional responsiveness.
- Quickness of warm-up.

*(Nazzaro, Council for Exceptional Children, 1978)

Figure 2

Creative Characteristics of The Gifted and Talented*

Few gifted children will display all of these characteristics, while characteristics do not necessarily define who is a gifted child, they do constitute observable behaviors that can be thought of as clues to more specific behaviors. These characteristics are signals to indicate that a particular child might warrant closer observation and could require specialized educational attention.

- They are fluent thinkers, able to produce a large quantity of possibilities, consequences, or related ideas.
- They are flexible thinkers, able to use many different alternatives and approaches to problem solving.
- They are original thinkers, seeking new, unusual, or unconventional associations and combinations among items of information. They also have an ability to see relationships among seemingly unrelated objects, ideas, or facts.
- They are elaborative thinkers, producing new steps, ideas, responses, or other embillishments to a basic idea, situation, or problem.
- They show a willingness to entertain complexity and seem to thrive in problem situations.
- They are good guessers and can construct hypotheses or "what if" questions readily.
- They often are aware of their own impulsiveness and the irrationality within themselves and show emotional sensitivity.
- They have a high level of curiosity about objects, ideas, situations, or events.
- They often display intellectual playfulness, fantasize, and imagine readily.
- They can be less intellectually inhibited than their peers in expressing opinions and ideas and often exhibit spirited disagreement.
- They have a sensitivity to beauty and are attracted to aesthetic dimensions.

*Taken from fact sheet prepared by the Council for Exceptional Children (1978) pursuant to a US OE grant.

Others have equated creativity with the highest level of "self-actualization" --a process which extends across the entire life span of the person. Should one adhere to this equation, then either a great many children up through the middle school years are "self actualized" on the highest level or a great many behaviors and products resulting from these children are the result of some other process besides "creative thinking." The latter is more likely to be true than the former. This is especially true as one recognizes that operating on the highest level of Maslow's hierarchy of needs implies that all lower "basic" needs have been satistifed and the individual is searching for that little something special or extra to become a fully actualized self (Mar'i, 1977).

Thus, from a developmental perspective, mental operations leading to creative behavior have to be explained in ways restricted to the particular mental operations of each developmental level. Hence, the thinking leading up to the behaviors would necessarily be qualitatively different on each level. Creativity may then have to be explained developmentally much as Kohlberg (1973) has attempted to describe cognitive moral reasoning as separate yet interrelated stages of development. Gowan (1978) has also argued on the qualitative differences between adult and child creative behavior and the probable mental operations behind these particular behaviors. If such were not the case, then we again are left with the explanation that external criteria is ultimately the determiner of what is creative--regardless of the mental operations behind the behavior itself.

More recently, the existence of a "universal process of creativity", called "Janus Thinking," has been proposed by Rothenberg (1979). Named after Janus, the two-faced Roman diety, Janus thinking is said to consist of actively considering two or more opposites or antitheses co-existing and simultaneously operating, a formulation that leads to integrated concepts, images, ideas and creations. To Rothenberg, Janus thinking differs from dialectical thinking in that it does not involve a synthesis or reconciliation and it does involve simultaneity rather than sequence.

While support for Janus thinking is found in Einstein's notes or implied from interpretations of the works of others (e.g., Shakespeare's plays, daVinci's sketches), there is no evidence that all creative behavior requires prerequisite "Janus thinking" or that all "Janus thinking" automatically results in creative behaviors. The argument that Janus thinking may represent a rather (and maybe the most) complex form of mental operation leading to some cases of creative behavior seems more appropriate.

The arguments for distinct internal creative thinking processes as evidenced by the above perspectives are indeed attractive ones. However, if, for instance, Janus thinking is a prerequisite for all creative outcomes, then to push for a program in creative problem solving may be of little consequence. After all, how many "Janus thoughts" did Einstien have in his entire life? More importantly, the identification of creativity with external criteria is more defensible from both the research and the instructional standpoints.

The importance placed on the external criteria for determining creative behavior has been defended from a cross cultural perspective by Mar'i (1977). In

considering four basic categories of criteria by which creative products have been and are evaluated and determined, he suggests that three could conceivable be used by the person creating the product (i.e., three could serve as internal criteria):

a) is it new and original?

b) is it correct and appropriate?

c) is it useful and functional?

The fourth criterion,

d) does it possess artistic quality or apparent attractiveness? is the most relative of all in the sense that it seems to be the most externally (and culturally) determined criteria.

While one could debate questions concerning the completion of this listing of criterion, the internal-external nature of each criterion, and even the degree to which each culture may use each of these in examining the creativity of a behavior or product, the fact remains that the assessment is made of the output of an individual regardless of the mental processes producing it. If such were not the case, then one could not call any product or behavior 'creative' unless one first knew of the mental processes that generated it.

If we were to examine the work of many of the great masters across the ages, cultures, and activities of human history, we would find that people like Homer, Chaucer, daVinci, Newton, Picasso, and Einstein have been considered as being 'creative' because of the external criteria which have been applied to assess their behaviors and works. The Inferno has long been and is still considered a creative masterpiece--and to assume that certain prerequisite experiences such as an "Aa-hhh!" moment, Janus thinking, or alpha wave patterns were operationalized for the several thousand verse lines of this work is a little difficult to accept.

What can be accepted is the fact that individuals constantly produce unique and new behaviors and products. Many of these are "better" in some ways than other behaviors and products. Some are by chance or intentionally more novel or unique than others. A few attract the attention of other persons. Even fewer of our behaviors and products are recognized by other people as being particularly unique and different. Where along the line does the "creative" adjective come into play to describe the behavior or product? Are we able to call products and behaviors "creative" without detailed knowledge of the assumed "creative thinking" processes which preceded them? Finally, and equally important, what adjectives should be attached to all those "non-creative" yet still new and different outcomes?

A Novel Solution to the "Creativity" Problem

Conclusions drawn from the research literature and personal experiences generated what appeared to be paradoxical perspectives as to the nature of creativity. The most abundant and attractive set of data suggests that an extremely wide variety of behaviors and products can legitimately be labeled "creative". Numerous examples

supporting this position can be found in all areas of human activity including art, dance, literature, and science. That a variety of outcomes have been and are considered to be creative cannot be denied. Incorporated in this position is the implied (or assumed) notion that these creations have been produced by some special, distinct creative thinking processes or mental states. Inherent in this position is the logical assumption that nothing can be considered creative without certain prerequisite mental operations and all outcomes of these processes or mental states are automatically "creative".

What becomes of new, different and unique outcomes which are not the results of such complex mental operations? From the above perspective, either there are varying levels or degrees of creative thinking processes, or some means must be found to distinguish between creative and not-creative new and different outcomes.

Almost antithetical to the first perspective is one which seems to ignore the internal processes leading up to a new behavior or product while relying heavily on the external criteria which ultimately determine whether or not an outcome is creative. From this orientation it would seem that "creative" is but one specific category for describing only qualitatively unique and appropriate outputs among all the multitude of different types or kinds of new, unique behaviors and products one can generate? Inherent in this position is the assumption that it is not the mental operations themselves which automatically generate creative outputs (although some operations do seem to be more productive of "creative" outputs than others). Rather it is external criteria applied to unique, novel behaviors which ultimately determine the degree to which a person's output is "creative". Thus, from this perspective, there must exist varying degrees or levels of producing new and different behaviors and products, with some outputs at all levels possessing qualitative properties enough to label them "creative".

In the final analysis, it seems that creative activity is a qualitative extension of a broad continuum representing all forms of new or novel behaviors and products. Therefore, rather than arguing for qualitatively different mental operations unique to creative behavior, it would seem more appropriate to identify qualitatively different mental operations likely to produce a variety of kinds of new, unique of different behaviors with "creativity" being attached to those outputs which are qualitatively unique as determined by some external criteria. The possibility of such a continuum as a new framework for investigations into the area of creativity warranted further exploration.

In review, no separate creative thinking process or processes exists which would serve as <u>the single cause</u> of all creative behavior. Behaviors and products are considered creative or "not creative" because of the external assessments which are made by people other than the "creator" himself or herself. It is this external assessment that explain why everything one "creates" is not necessarily "creative". If no external assessment is required, then will you allow me to honor myself by calling this paper a very, very "creative" masterpiece??--(and to think my World Literature teacher said I had nothing in common with Dante except that we've both been through Hell!)

At the same time, individuals are quite capable of generating creative behaviors and products in a number of different ways using different mental operations in the process. In fact, many all new, different and unique outputs are the very results of different mental operations. To argue that exact and distinct mental operations are responsible for all creative behaviors in all areas, at any age, across all societies, at all times cannot be supported by any credible research evidence. There are, however, behaviors and products which can be produced using a variety of mental operations with each output being judged for its own uniqueness apart from as well as appropriate to the external criteria associated with creativity. Subsequently, as we come to better understand the various ways individuals may produce unique and different behaviors separate and apart from "creativity", then creativity itself may be better understood.

The next segment of this paper will propose a novel approach to explaining how new behaviors and/or products may be produced. It will be suggested that educators begin using the word "novel" to describe any new response or product by an individual and the word "creative" only when very specific external criteria have been met. It will propose a system for classifying novel forms of behaviors and products for use in observation and measurement settings.

The Taxonomy of Novel Forms of Behavior and Products

The Taxonomy contains eleven (11) categories or classes for describing those psychological variables most likely to result in a new, different or unique behavior or product for a given person. These outcomes are considered to be "novel" in that they represent new and different (and quite possibly, unique) activities for that person. These categories seek to describe internal variables operating to generate behaviors and products and are not meant to identify criteria to determine the quality of the outcome.

Being novel does not automatically imply that the behavior or product is "creative". According to this model, being creative implies the output has satisfied external criteria such as its quality, utility, appropriateness and so forth in addition to its newness, originality, and uniqueness. (These "creativity" criteria are addressed following the presentation of the Taxonomy).

The eleven categories of the Taxonomy are arranged in ascending order, from what might be labeled the simplest to the most complex operation of psychological variables. As constructed, each higher level operates relatively independent of the lower levels although in some instances it is assumed the individuals have (or can) operated on the immediately adjacent lower level prior to their "higher level" activities. These categories do not describe the specific overt behaviors or products of an individual. Rather, they describe the intent, level of concrete-abstract understanding, degree of information utilization, and degree of conceptualization with abstractions which underlie and ultimately influence the person's actions. These several aspects of mental operations are the primary "psychological variables" which are described by these eleven categories.

Consequently, and theoretically, the behaviors and products resulting from several different categories of psychological variables could be identical to one another, but for different reasons. For example, a novice with a brush might drip paint on a canvas and quite accidentally produce a painting which is a mirror-image of one painted by a well known "creative" artist. Hence both paintings represent novel products for the two individuals involved irrespective of the fact that they are identical to one another. Using the Taxonomy, it is possible to distinguish between the two paintings on the basis of different psychological variables which lead to their production--with the emphasis on the distinctions between the internal elements behind the production. Thus we may consider "qualitative" differences between the mental operations themselves which often run quite independent of the qualitative attributes of the final, observable output itself.

This taxonomic model represents a practical framework for understanding activities which may result in novel behaviors and products. The model provides a useful guide for looking at a wide range of ways and circumstances which result in outputs which are often assigned the label "creative". The Taxonomy has applicability in classifying novel behaviors and products according to the internal variables which produced them. At the same time, the Taxonomy avoids making qualitative judgments about the actual outcomes of these internal operations.

The Taxonomy stresses the characteristics of the psychological variables which ultimately produce the novel performance(s) rather than on the final form or features of the behavior or products itself. Its categories describe mental orientations and operations more immediate to the actual cause of the novel performances. Be design, these categories focus on the psychological factors which serve to generate behaviors and are not concerned with whether or not the individual was engaged in problem solving, divergent thinking activities, or brain-storming at the time of the behavior. Being descriptions of inferred psychological variables and information processing operations, the model suggests that in most cases one cannot infer the level of individual novelty production from the overt behaviors and products themselves--unless the person has provided some external evidence of these internal operations (e.g., a written explanation, an oral statement, etc.).

In addition to these general orientations and characteristics of the Taxonomy, the following suggest other dimensions which are considered within the perspective of this model:

a) Concrete-abstract dimension. In a general sense, as one moves up the hierarchy, one moves from consideration and emphasis on the concrete (i.e., the external, physical, objectively real features) toward the abstractions (i.e., the essence or qualities of the real) which they represent. The Taxonomy makes a distinction between knowing and working with something as a concrete entity and understanding and using it as an abstraction. Abstract understanding implies the conceptualization of an entity in terms of its nature, essence, qualities, and so forth. For instance, the distinction between knowing 'art' as specific paintings and understanding 'art' on a conceptual level which transcends specific examples of art works.

b) Association between concrete-abstract phenomena. While the concrete and abstract represent two distinct perspectives and ways of understanding, it is important to recognize that these two are closely

interrelated with one another. This Taxonomy considers this relationship a critical one because individuals use concrete entities to express and represent abstractions. It is also possible for persons to work with and manipulate concrete features and objects with little or no understanding of the abstractions appropriate to these concrete phenomenon. For instance, knowing of specific deaths and dead people (i.e., concrete examples) does not imply the person understands "death" as an abstraction. Meanwhile, individuals who develop abstract understandings of "death" often use concrete phenomenon such as "sleep," "decomposition," and "stone cold rest" to represent their abstraction conceptualizations. Because associations between the concrete and the abstract are important in real life situations, these associations are incorporated within the framework of the categories of this model.

c) Moving from concrete towards the abstract. The higher levels of the Taxonomy gradually incorporate the integration of abstract, internalized understandings which may ultimately take form in or be represented by concrete entities while the lower levels concern themselves with these entities as the concrete objects/features they are. Thus, abstract conceptualization is closely linked with the increasing ability of the individual to internalize and utilize the "intent" or "meaning" as opposed to sticking to the "letter" of a rule, principle, or guideline.

d) The intentionality dimension. The lowest level of the Taxonomy, "Accident", recognizes the fact that individuals may produce different and new behaviors or products quite unintentionally and purely by chance incident. The levels above Accident assume that the individual is operating in terms of some degree of intent, although the intent does not have to be always conscious or persistent throughout the entire time prior to the actual behavior. The so-called "incubation period" suggested by some would be one example of unconscious intentionality at work.

e) The simple/single-complex dimension. The lower stages of the Taxonomy stress the use of single or sequential phenomenon in order to produce novel outputs. Yet, as one moves towards the higher levels, the person gradually moves to incorporate multiple ideas, guidelines, and rules in framing a response. Thus, the person may move from considering separate, distinct concrete entities towards integrating several abstract understandings in the production of a behavior. As one moves into the higher categories, the more complex the mental operations become as more rules and guidelines are incorporated and integrated into one's mental processings. For example, "dialectical thinking" and "Janus thinking" both involve more complex processings than that of a seven year old child 'creating' a new hairstyle on a Barbie Doll according to the directions provided on the box.

These are a few of the areas relative to thinking, behaving, and operating which have been incorporated into the Taxonomy. The above provides a brief overview of the dimensions most likely to supply the foundation for understanding the Taxonomy as a model.

The categories of the Taxonomy. Brief Definitions.

The eleven categories of the Taxonomy of Novel Forms of Behavior and Products are defined below.

1. Accident. Accident is the production or demonstration of a new behavior or product which is purely unintentional, unexpected, and occurs by chance. Behaviors or products are considered accidents when they occur by chance rather than are the results of deliberate, conscious efforts on the part of the individual to attain the end which occurs.

2. Accommodation. Accommodation is the mental activity which involves largely typical, casual and/or routine adjustments and adaptations a person makes in day-to-day life situations. These behaviors or products represent minor adjustments needed in normal, mostly habitual patterns of behavior. This form of novel behaviors and products include different and new responses of persons to make minor adjustments in daily life functionings.

3. Reproduction. Reproduction is the mental activity featuring the ability to remake in the exact form the surface features and content by tracing the original. The focus of the person's effort is to develop a 'new' product or behavior which is identical in every possible way to the original or 'master.' Most often this behavior involves the lifting via tracing or copying from an original with the intent to copy the original as truly as possible. Thus, the person remakes in the exact or near exact form the surface features and content by trace-copying an original.

4. Duplication. Duplication is a mental activity leading to a new behavior or product which is to be an equivalent form of or corresponds closely to an original. This activity involves the intentional effort to copy, denote, reconstruct, or express the surface features of an original by other than trace-copying procedures. Duplication includes the deliberate act of constructing as nearly as possible the concrete or surface features of an original without being concerned with (nor making use of) the underlying messages, intentions, or principles upon which the original was developed or based.

5. Fabrication. Fabrication is the mental activity which features the effort to alter or modify the surface features or arrangement of an original just to give it a new appearance. Fabrication may also involve the intentional rearrangement, re-mixture, recombination of surface features solely for the purpose of altering the original given surface features or characteristics. In this sense, the person makes up or 'fabricates' a new behavior pattern or product by working on the surface, concrete elements or features of a given original.

6. Imitation. Imitation is the mental activity which involves the effort to model or replicate a concrete or surface product with some minimal understanding of the principles, guidelines or abstractions which are represented by the original product or entity. This form of novelty involves the deliberate effort to copy an original or follow a set of procedures as nearly as possible without dwelling at length on the underlying understanding and abstractions which they represent. This effort may also be represented in a person's actions to follow a set of rules, procedures, or guidelines as they are presented even though the person has only a casual acquaintance with the underlying assumptions, abstractions, etc. upon which they are based.

7. Transfersion. Transfersion is the mental activity which results in the application of a set of principles or procedures in situations somewhat different than where and how they were first learned. For this behavior, the person has already demonstrated the acquisition of the meaning and use of the principles or procedures and is thus extending these to other situations where they are or could be used. Examples of "transfer of training" are often examples of this level of novelty.

8. Substitution. Substitution is the mental activity which includes the intentional effort to replace or manipulate parts of an original in order to form a new product or behavior which has somewhat the same message and/or intent of the original but with different surface features. Here the person uses metaphors, synonyms, and the like in order to modify, develop or refine an original in order to express more totally, vividly, and appropriately the message, meaning or idea which is at the focus of the person's activities.

9. Experimentation. Experimentation is the mental activity which involves the effort to combine, mix, and use a set of principles or guidelines understood as abstractions as well as the concrete entities or features which they represent. This effort involves the use of several different principles and guidelines which are used to develop a final product. While sometimes used in trial-and-error situations, the person engaged in writing themes, technical reports, etc. provide the most frequent examples of this type of novel behavior.

10. Innovation. Innovation is the mental activity which features the making use of the meaning or "essence" of a set of principles or guidelines understood as abstractions which operating independently of specific concrete features or entities which have here-to-for been associated with those principles or guidelines. Here the person understands conceptually the "intent" of the principles, rules or guidelines and is thus independent of the "letter" of these real things.

11. Generation. Generation is the mental activity which is characterized by the interrelating, synthesizing, or integrating two or more sets of principles or guidelines understood as abstractions to produce an entirely new set of guidelines which represents the "best" of the previous separate sets. This new set is characterized by internal consistency, appropriateness to the situation, adequacy, and relative simplicity. Persons use a 'synthesis-like' mental procedure (e.g., dialectical or Janus-thinking) to arrive at the new idea, explanation, or procedure.

The above represent rather short descriptions of the categories suggesting ways of looking at the mental processes leading up to different types of novel behaviors and products for the individual. It does not describe the specifics of the resulting products or behaviors since these are to be left to external criteria. Classroom teachers and researchers are thus urged to pay more direct attention to the types of thinking going on before the behavior or product rather than to merely infer certain thinking activities from the products or behaviors themselves.

The Taxonomy makes no distinction between the absolute skill level necessary to go beyond the initial behavior or product and the demonstration of sophisticated skills which embellish the original behavior or product. For example, on the Reproduction level, the Taxonomy does not differentiate between a perfect and a poor tracer or copier. It states only that either quality of tracing or copying effort or product is Reproduction-type behavior. It does state that on the upper levels individuals must be mastered the understandings of guidelines and principles as abstractions before they can be employed in upper level thinking behavior. By noting these levels of skills and expertise, the Taxonomy includes individuals who lack the sophisticated mechanical and psychomotor skills to qualitatively refine their behavior or product.

The Taxonomy also makes no distinction between the mental activities leading to novel behaviors and products which are positive and those which are negative. Thus, individuals may trace an erotic Picasso drawing or a scribbled signature and both would be classified as Reproduction. Developing a unique peace plan to solve the Middle East conflict would be just as acceptable within this Taxonomy as the development of a unique plan to destroy the city of New York.

At present the Taxonomy is being informally investigated for its applicability in such areas as art, creative writing, and interior design. Examples which fit the eleven categories are being identified to further illustrate each of these behaviors and/or products in more concrete ways. At the same time, the implications for learning higher level novel behaviors in situations where students need to demonstrate such behaviors in order to be successful (e.g., being able to write a creative poem in a creative writing class) are being explored. Informal observations and conversations with teachers have resulted in some feedback which indicates that students with the most difficulty in art classes seem to be those who operate on the Imitation level or below. Thus, higher levels of novel thinking demand certain conceptual and abstract cognitive understandings which many such students appear to lack. The unavailability of funds currently limits the research efforts which are needed to investigate this construct and its practical applications for classroom teachers and educational researchers.

FROM NOVELTY TOWARD CREATIVITY: BRIEF REMARKS

The orientations suggested by the Taxonomy in terms of distinct differences between the psychological variables leading to the generation of novel behaviors and products and the qualitative characteristics of the products and behaviors themselves are not new. In describing the highly multiordinal concept of creativity, Irving Taylor (1975b) proposed a way of viewing creativity according to (a) creative dispositions, (b) creative transformation processes, and (c) criteria for identifying creative products and behaviors. Having only recently reviewed Taylor's work, the author was pleasantly suprised by the relatively close agreement between out mutual perspectives.

For instance, Taylor (1975b) describes five transactional dispositions to creativity. These five represent distinct clusters of psychological variables with each involving different mental operations. Each of these clusters or usages seem to relate to a different developmental level of novelty production, each sufficiently different to suggest that very different psychological variables are involved. These five dispositions are:

1) Expressive creativity
2) Technical creativity
3) Inventive creativity
4) Innovative creativity
5) Emergentive creativity (Taylor, 1975b, pp. 305-308)

These five are highly compatible with the description and operations included with the taxonomic levels just presented.

Taylor also relies heavily on the end product of output carrying the burden as the major determiner of whether "creativity" is in fact present. A creative product may be as tangible as a new behavior or object or as intangible as an idea or principle. The essential question of a creative product, argues Taylor, is that of criteria. Criteria for assessing the person's product or output can be described in terms of (a) the product itself as an entity, (b) the problem which it resolves, (c) the field in which it is presented, and (d) its out-of-field effects (p. 313). The Creative Product Inventory Taylor, 1975) incorporates these criteria into a single system of assessment.

While this is not the time to discuss the system in detail, Taylor's seven criteria (Generation, Reformation, Originality, Relevancy, Hedonics, Complexity, and Condensation), each with four sublevels, present rather objective means for examining and assessing the "creative" aspects of a product or behavior. The value of this system is not only its focus on the external factors of a person's products and its suggestion that external criteria for establishing a "creative level" for such products, but it is objective such that individuals can be trained to use these criteria in very objective, systematic and reliable ways.

More importantly, the approach proposed by Taylor supports very strongly the ideas presented throughout this paper that the practices of tying "creativity"to distinct, creative thinking psychological processes must be abandoned in favor of more definable frameworks which are more defensible in that they are more consistent with what is known from research on thinking, learning, and memory.

SUMMARY

The intent of this paper was to develop a rationale for a new way of thinking about the generation of novel products and behaviors by a person as well as to present a system, the Taxonomy of Novel Forms of Behaviors and Products, which describes different ways one can produce such novel outcomes. As presented here, creativity is in many cases and ways truly "in the eyes of the beholder" and not necessarily "of the originator." Thus, creativity is not and can not be automatically associated with certain creative thinking processes--since such processes do not exist. Rather, creative products may be generated from a whole range of different psychological variable operating in different ways resulting in new, unique and original novel outcomes. In the final analysis, it is the quality determine whether or not an individual's novel forms of behaviors or products are "creative."

REFERENCES

Berelson, Bernard and Steiner, Gary A. Human behavior: An inventory of scientific findings. New York: Harcourt, Brace & World, 1964.

Crockenberg, Susan B. Creativity tests: A boon or boondoggle for education? Review of Educational Research, 1972, 42, (1, Winter), 27-44.

Cronbach, L. J. Intelligence? Creativity? A parsimonious reinterpretation of the Wallach-Kogan data. American Educational Research Journal, 1968, 5, (4), 491-512.

DeHaan, R. F. and Havighurst, R. J. Educating gifted children. Chicago: University of Chicago Press, 1957.

Ebel, Robert L. And still the dryads linger. American Psychologist, 1974, 29, (7, July), 485-492.

Gallagher, J. J. Teaching the gifted child. Boston: Allyn and Bacon, 1975.

Gallagher, J. J. Teaching the gifted child. Boston: Allyn and Bacon, 1964.

Getzel, J. Creativity. In, Encyclopedia of educational research. (4th ed.). New York: MacMillan, 1969.

Gowan, J. E. Gifted child education on utopia. Gifted Child Quarterly, 1978,

Guilford, J. P. Creativity tests for children. Orange, CA: Sheridan Psychological Services, 1973.

Guilford, J. P. Traits of creativity. In H.H. Anderson (Ed.) Creativity and its cultivation. New York: Harper, 1959, 142-161.

Khatena, J. & Torrance, E. P. Thinking creatively with sounds and words: Norms technical manual. Lexington, MASS: Personnel Press, 1973.

Lytton, Hugh Creativity and education. Schocken, 1972.

Langer, J. Werner's comparative organismic theory. In Mussen, P. H. (Ed.), Carmichael's Manual of Child Psychology, Vol. I, 3rd ed., New York: Wiley & Sons, 1970, 733-772.

Mar'i, Sami Khalil Toward a cross cultural theory of creativity. The Journal of Creative Behavior, 108-.

Martindale, Colin What makes creative people different? Psychology Today, 1975.

Mednick, Sarnoff A. The associative basis of the creative process. Psychological Review. 1962, 69, 220-232.

Nazzaro, Jean N. Identification of the gifted and talented. (CEC Factsheet). Reston, VA: Council for Exceptional Children, 1978.

Patrick, C. Creative thought in artists. Journal of Psychology, 1937, 4, 35-73.

Rothenberg, Albert Einstein's creative thinking and the general theory of relativity: A documented report. American Journal of Psychiatry, 1979, 136, (1, January), 38-43.

Stahl, Robert J. A creatively creative taxonomy on creativity: A proposed model. The North Carolina Association for the Gifted and Talented, 1977, 3, (3, Summer), 8-16.

Stahl, Robert J. & Stahl, Richard L. The creative child and the role of values clarification. The North Carolina Association for the Gifted and Talented Quarterly Journal, 1976, 2, (3, Summer), 23-30.

Taylor, Irving A. A retrospective view of creativity investigation. In I. A. Taylor and J. W. Getzels (Eds.). Perspectives in creativity, Chicago: Aldine, 1975a, 1-36.

Taylor, Irving A. An emerging view of creative actions. In I. A. Taylor and J. W. Getzels (Eds.). Perspectives in creativity, Chicago: Aldine, 1975b, 297-325.

Tiedt, Sidney W. Creativity. Morristown, New Jersey: General Learning Press, 1976.

Torrance, E. Paul Creativity research in education: Still Alive. In I. A. Taylor and J. W. Getzels (Eds.). Perspectives in creativity, Chicago: Aldine, 1975, 278-296.

Torrance, E. Paul Torrance tests of creative thinking: Norms-technical manual. Princeton, New Jersey: Personnel Press, 1966.

Torrance, E. Paul Education and the creative potential. Minneapolis: University of Minnesota Press, 1963.

Torrance, E. Paul Status of knowledge concerning education and creative scientific talent. Salt Lake City, University Press, 1961.

Vance, H. "Creativity and the gifted. NCAGT Quarterly Journal, 1976, 2, (3, Summer), 38-44.

Wallas, G. The art of thought. New York: Harcourt, Brace, 1926.